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IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

- 1-12. (Canceled)13. (New) A spin valve sensor comprising:
- 2 a first pinned layer having a first width and a first magnetic orientation;
- a free layer, disposed above the first pinned layer and separated from the first pinned
- 4 layer by a spacer, the free layer having a second width disposed above the first pinned layer;
- a ferromagnetic bias layer having the second width disposed above the free layer and a
- 6 second magnetic orientation orthogonal to the first magnetic orientation; and
- an antiferromagnetic bias layer disposed above the ferromagnetic bias layer, the
- 8 ferromagnetic bias layer being exchange coupled to the antiferromagnetic layer;
- 9 wherein the second width is smaller than the first width.
- 1 14. (New) The spin valve sensor according to Claim 13, further comprising:
- a second pinned layer having a third magnetic orientation anti-parallel to the first
- 3 magnetic orientation; and
- a coupling layer disposed between the first and second pinned layers.
- 1 15. (New) The spin valve sensor according to Claim 14, wherein a thickness of
- 2 the first pinned layer is substantially equal to a thickness of the second pinned layer.
- 1 16. (New) The spin valve sensor according to Claim 15, further comprising an
- 2 anti-ferromagnetic (AFM) layer disposed adjacent to the first pinned layer.

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| 1 | 17. (New) The spin valve sensor according to Claim 16, wherein a thickness of |
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| 2 | the AFM layer establishes exchange coupling between the AFM layer and the first pinned |
| 3 | layer. |
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| 1 | 18. (New) The spin valve sensor according to Claim 16, wherein the first and |
| 2 | second pinned layers are self-pinned. |
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| 1 | 19. (New) A magnetic storage system, comprising: |
| 2 | a magnetic recording medium; |
| 3 | a spin valve sensor disposed proximate to the recording medium, the spin valve |
| 4 | sensor, including: |
| 5 | a first pinned layer having a first width and a first magnetic orientation; |
| 6 | a free layer, disposed above the first pinned layer and separated from the firsst |
| 7 | pinned layer by a spacer, the free layer having a second width disposed above the first pinned |
| 8 | layer; |
| 9 | a ferromagnetic biasing layer having the second width disposed above the free |
| 10 | layer and a second magnetic orientation orthogonal to the first magnetic orientation; and |
| 11 | an antiferromagnetic bias layer disposed above the ferromagnetic bias layer, |
| 12 | the ferromagnetic bias layer being exchange coupled to the antiferromagnetic layer; |
| 13 | wherein the second width is smaller than the first width. |

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1 20. (New) The magnetic storage system according to Claim 19, further 2 comprising: 3 a second pinned layer having a third magnetic orientation anti-parallel to the first 4 magnetic orientation; and 5 a coupling layer disposed between the first and second pinned layers. (New) The magnetic storage system according to Claim 20, wherein a 1 21. 2 thickness of the first pinned layer is substantially equal to a thickness of the second pinned 3 layer. 1 22. (New) The magnetic storage system according to Claim 21, further 2 comprising an anti-ferromagnetic (AFM) layer disposed adjacent to the first pinned layer. 1 23. (New) The magnetic storage system according to Claim 22, wherein a 2 thickness of the AFM layer establishes exchange coupling between the AFM layer and the 3 first pinned layer. 1 24. (New) The magnetic storage system according to Claim 22, wherein the first 2 and second pinned layers are self-pinned.